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NEW RESEARCH IN DEVELOPMENT ECONOMICS: MARRIAGE, MOTHERHOOD, AND CONFLICT[†]

Motherhood and Female Labor Force Participation: Evidence from Infertility Shocks

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Women are underrepresented in the paid labor force in both developed and developing countries. Recent scholarship has argued that labor force differentials are not due to gender per se, but can be attributed to the fact that women disproportionately face the responsibilities associated with bearing and raising children.[1] While the negative relationship between the presence of children and participation in the labor force is well established, interpretation of this relationship is complicated by the endogeneity of fertility. The number of children a woman has is a choice variable which could be influenced by her labor force participation. Additionally, there are likely to be omitted factors that influence both fertility and labor force participation. For instance, women with high career-based unobservables (such as ambition or talent) may choose to have fewer (or no) children, and these women may be overrepresented in the labor force. Thus, the observed negative relationship between children and labor force participation could be spurious.

Several studies have exploited exogenous changes in family size in order to identify the causal relationship between the number of children and female labor supply. Examples of this approach include twins at first birth (Stephen G. Bronars and Jeff Grogger 1994; Joyce Jacobsen, James W. Pearce III, and Joshua L. Rosenbloom 1999) and the sex composition of the first two children (Joshua D. Angrist and William N. Evans 1998; Guillermo Cruces and Sabastian Galiani 2007). In most cases, these approaches lead to a reduced but still significant effect of children on female labor supply. We propose an alternative exogenous source of variation in family size based on infertility shocks to find the causal effect of children on female labor force participation. Clearly, infertility affects the number of children a women can have. In addition, other than the fact of increasing with age, infertility is virtually random. Thus, an indicator variable for the infertility status of women of childbearing age is a plausible instrument for childbearing.[2] An advantage of this new instrument is that, unlike previous studies that use twinning or sex mix to generate variation in the number of children, our empirical strategy can investigate the differential labor supply between childless women and women with children. Thus, we are able to identify the causal effect of having children on female labor force participation for a broader sample of women.

We apply this methodology to a sample of women in six Latin American countries, where OLS estimates suggest a negative relationship between children and women's labor force participation. Our main finding is that, after using the infertility instrument, there is no evidence

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[1] See Jane Waldfogel (1998) for a general discussion of the family gap and Claudia Piras and Laura Ripani (2005) for evidence that a family gap exists in Latin America.

[2] Our identification strategy most closely resembles Julian P. Cristia (2006) who investigates differences in employment outcomes by child status for women seeking help to become pregnant.

that children have a causal effect on the labor force participation of women.

I. Background Information on Infertility

The medical literature defines infertility as the failure to conceive after a year of regular intercourse without contraception.[3] It is well established that infertility increases with a woman's age (David B. Dunson, Donna D. Baird and Bernado Colombo 2004). However, the medical literature is not in agreement about what other factors, if any, influence infertility. There is some evidence suggesting that indicators of poor health such as sexually transmitted diseases, high body mass index (BMI), and miscarriages are associated with infertility (Francine Grodstein, Marlene B. Goldman and Daniel W. Cramer 1994). Infertility appears to be a random event, however, in that the mother's background characteristics are unrelated to observed heterogeneity in fertility (Michael Joffe and Isobel Barnes 2000).

II. Data and Methodology

We use cross-sectional data from the Demographic and Health Surveys (DHS) in Peru (conducted in 1996), Guatemala (1998), Colombia (1995), Bolivia (1994 and 1998), Nicaragua (1998), and the Dominican Republic (1996). The DHS are standardized nationally representative household surveys in developing countries. Women answered questions about their employment status, birth history, contraceptive use, fertility preferences, education, and marital and health status.

We identify self-reported infertility in two ways. The first is when women mentioned subfertility or infertility as their reason for not currently using contraceptives. In the second, when asked about their desire for future children, nonsterilized women responded that they are unable to have more children. We define a woman as infertile in either of these cases. In keeping with the medical definition of infertility, we can identify infertility only for nonsterilized women who are not currently taking contraceptives. These women constitute more than 60 percent of the sample.

We exclude from the sample students, women who were using contraceptives, sterilized women, and women who have never had a sexual encounter. Our main sample contains 24,131 women between the ages of 20 and 44. When including health indicators, asked to only a subsample, the number of observations is reduced to 15,992.

Our labor force participation variable takes the value of one if a woman reported working for pay during the week prior to the survey, and zero otherwise. We define the number of children in three separate ways: the number of children living at home, the number of children under the age of six, and a binary variable equal to one if the woman has at least one child, and zero otherwise. In the sample, 52 percent of women participated in the labor force, 7.3 percent report being infertile, 84 percent have at least one child, and the average woman has 2.5 children living at home.

For the sample described above, the main specification is given by

$$(1) \qquad LFP_i = \alpha + \beta K_i + \Sigma_j \gamma_j AGE_{j,i} + \mathbf{X}_i{}'\delta + e_i,$$

where LFP_i is equal to one if the i-th woman is in the labor force, and zero otherwise. The key variable is K_i and it captures the number/presence of children living at home. Thus, β is the parameter of interest. Because of the nature of infertility, we include the woman's age in the form of binary age-group categories (indexed by j) in all specifications. Vector $\mathbf{X}_i$ varies by model. Model 1, the most parsimonious model, includes categorical indicators of educational attainment, age, age and education interactions, and country fixed effects. Model 2 contains Model 1 and adds control variables that may influence labor force participation, such as age at first intercourse, marital status, age at first marriage, spouse's education, and past and current location. Finally, Model 3 contains all of the variables in Model 2, plus an indicator of health status.

OLS estimates of β are likely to be biased due to unobserved variables in e_i. The direction of

[3] Infertility can further be broken down into primary infertility, which describes women who have never been able to conceive a pregnancy, and secondary infertility, describing those who have had at least one successful pregnancy, but have not been able to achieve another.

Table 1—Women's Characteristics by Fertility Status

Women's characteristics (V_i)	Infertile (θ_1)	Fertile (θ_2)	Test $\theta_1 - \theta_2 = 0$
Works (= 1)	0.408 (0.032)	0.397 (0.046)	0.011 [0.031]
Grew up in urban areas (= 1)	0.403 (0.061)	0.357 (0.053)	0.047 [1.40]
Age at first intercourse (years)	17.47 (0.216)	17.2 (0.118)	0.294 [1.52]
Ideal number of sons	0.975 (0.100)	1.00 (0.064)	−0.028 [−0.41]
Ideal number of daughters	1.06 (0.139)	1.03 (0.087)	0.025 [0.31]
Completed more than primary school (= 1)	0.519 (0.077)	0.427 (0.061)	0.092 [2.51]
Never married (= 1)	0.099 (0.019)	0.154 (0.019)	−0.055 [−4.25]
Spouse completed more than primary school (= 1)	0.585 (0.084)	0.487 (0.073)	0.097 [2.40]

Note: Standard errors in parenthesis and *t*-statistics in brackets.

bias is given by two elements: the relationship between the omitted variable and the outcome variable (LFP_i), and its relationship with the variable of interest (K_i). In particular, consider the case when a driving force for women to join the labor market is their career ambition. If ambition correlates positively with the outcome variable and negatively with the number of children, excluding this variable from equation (1) biases the OLS estimates upward, since part of the estimated effect of children on labor force participation is actually due to ambition. We will use infertility to instrument for K_i in equation (1) to address the endogeneity concern.

Infertility is a valid instrument if it is unrelated to omitted variables that influence labor force participation. Table 1 presents evidence on the validity of our instrument. This table reports coefficient estimates for our fertility measures from a series of regressions (indexed by V_i) which, in addition to fertility status, control for age as follows:

$$V_i = \theta_1 Infertile_i + \theta_2(1 - Infertile_i) + \Sigma_j \rho_j AGE_{j,i} + \eta_i. \quad (2)$$

In essence, these regressions ask, controlling for age, whether infertile women are different from their fertile counterparts ($\theta_1 - \theta_2 = 0$). Table 1 shows that for many important outcome variables, infertile women mirror their fertile counterparts. They have the same labor force participation rates, the same childhood background, and became sexually active at the same age. Importantly, when asked about their desired fertility, there is no difference by fertility status. Infertility thus mimics an experiment in which nature assigns, to each woman, a random upper bound for the number of children, independent of background and preferences. However, infertile women are more likely to be married, have more education, and have more educated spouses than their fertile counterparts. Thus, it will be important to include these variables in our regression analysis.[4]

For our instrument to be valid, infertility should be correlated with the number of children a woman has. Table 2 shows the first-stage results. Infertility is highly correlated with the number of children a women has. On average, infertile women have one fewer child, 0.5 fewer preschool-aged children, and are 20 percentage points more likely to be childless than their fertile counterparts. The *F*-tests show that our instrument has sufficient power in all specifications.

III. Results

Column (i) of panel A in Table 3 presents the OLS estimate, which suggests that each additional child decreases labor force participation by 3.2 percentage points. Column (ii) contains the corresponding IV estimate. It suggests that the effect of children on labor force participation, using the variation in number of children that comes through the infertility channel, is nonexistent. This is the main result of the paper. The IV point estimate (0.003) is close to zero and statistically insignificant, suggesting that the OLS parameter was overestimated. This is consistent with the case where unobserved variables, such as career ambition, are important

[4] We also find some evidence that health influences fertility: infertile women are more likely to report a miscarriage and they are more likely to be categorized as obese (see Web appendix at http://www.aeaweb.org/articles.php?doi=10.1257/aer.98.2.500.)

Table 2—First-Stage Results of Infertility on Number of Children

	Children at home			Children under 6			Has at least one child		
Model:	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Coefficient	−1.093	−1.098	−0.969	−0.507	−0.524	−0.404	−0.212	−0.226	−0.160
	(0.064)	(0.068)	(0.068)	(0.039)	(0.040)	(0.036)	(0.012)	(0.010)	(0.029)
F-test	292.3	262.4	200.7	170.9	170.3	129.7	338.8	485.9	29.7
Observations	24,131	24,131	15,992	24,131	24,131	15,992	24,131	24,131	15,992

Notes: Robust standard errors clustered at regions in parentheses. Model 1 includes: age, education, age and education interactions, and country fixed effects. Model 2 includes Model 1 and marital and location information. Model 3 includes Model 2 and BMI indicators. All models include sample weights.

factors explaining both female employment and number of children. In column (iii) of panel A, we take advantage of having two separate measures of infertility and use each as an instrument to run a Hansen J-test for overidentifying restrictions. The GMM model confirms our findings and the J-test statistic rejects the null hypothesis that our instruments are valid.

Continuing in panel A, Model 2 includes additional control variables. If infertility is unrelated to other determinates of labor force participation, then their inclusion should not alter our findings. This is confirmed as the results from Model 2 mirror the results from Model 1.

In Model 3, we also add information about health (proxied by BMI) to the regression. It is possible that our infertility measure is capturing poor health and that poor health could directly influence labor force participation, thus invalidating our identification strategy. However, the main finding persists in Model 3. Children have a significant and negative impact in the OLS and no impact on labor force participation in either the IV or the GMM specification.

Panel B repeats the exercise above where the number of children under the age of six is the main variable of interest. Perhaps the barriers to labor force participation are higher for women with preschool-aged children than for women with older children. In all models, the OLS estimates suggest that this is indeed the case, as each additional preschool-aged child reduces labor force participation. Once again, however, the IV results suggest that there is no causal relationship between preschool-aged children and labor force participation.

Finally, since infertility has an impact on the fecundity of all women, we can investigate the differences between childless women and women with children. It is possible that the first child has a large impact on work behavior and that subsequent children have a much smaller impact. In panel C, our main variable asks if a woman has at least one child. OLS estimates suggest that childless women are much more likely to participate in the labor force. However, columns (ii) and (iii) suggest that there is no causal relationship between motherhood and labor force participation.

To summarize, the OLS estimates consistently show a significant negative relationship between labor force participation and the presence or number of children, while the IV and GMM estimates show no effect. This result is robust to numerous alternative specifications. We have also considered heterogeneous effects (not shown) by estimating the models separately by education, age, number of children, and country, and the main results persist in these subsamples.

IV. Conclusions

Our paper investigates the relationship between children and labor force participation for women in Latin America. We use a strategy in which nature prevents some women from obtaining their desired fertility levels. We find that, at least for the population of women who are not actively controlling their fertility, having children is not a barrier to participation in the paid labor force.

These results contrast with Cruces and Galiani (2007), who find that women who are induced to have a third child, out of a desire for a balanced sex mix of their children, are less likely to participate in the labor force. Our identification strategy may be applicable to a broader population. In Cruces and Galiani, the local average treatment effect comes from women whose fertility is altered because of their preference for

TABLE 3—THE EFFECT OF CHILDREN ON WOMEN'S LABOR FORCE PARTICIPATION

	Model 1			Model 2			Model 3		
	OLS (i)	IV (ii)	GMM (iii)	OLS (iv)	IV (v)	GMM (vi)	OLS (vii)	IV (viii)	GMM (ix)
A. Number of children at home									
β	−0.032	0.003	0.010	−0.024	−0.000	−0.002	−0.024	−0.004	−0.006
	(0.003)	(0.018)	(0.015)	(0.003)	(0.016)	(0.013)	(0.004)	(0.018)	(0.018)
J−statistic			[0.76]			[0.97]			[0.08]
B. Number of children under 6									
β	−0.077	0.007	0.023	−0.058	0.001	0.012	−0.051	−0.010	−0.002
	(0.007)	(0.038)	(0.036)	(0.005)	(0.033)	(0.030)	(0.007)	(0.043)	(0.046)
J−statistic			[0.69]			[0.93]			[0.07]
C. Has at least one child									
β	−0.095	0.017	0.051	−0.064	−0.020	−0.025	−0.090	−0.026	−0.016
	(0.014)	(0.090)	(0.071)	(0.010)	(0.076)	(0.060)	(0.014)	(0.111)	(0.107)
J−statistic			[0.77]			[0.97]			[0.08]

Notes: Robust standard errors clustered at regions in parentheses. p-value for Hansen J-statistic in brackets. See Table 2 for model definitions, number of observations, and sample weights.

mixed-sex offspring. Our data contain information on women's preferences over the gender composition of their children. It appears as if women who have a preference for mixed-sex composition are systematically different from the population at large. Infertility, on the other hand, affects women irrespective of their family preferences, which could explain the difference across findings.

Our results provide little support for the belief that the rise in female labor force participation in Latin America can be attributed to declining family sizes. However, a common factor such as the empowerment of women could be driving both trends. In addition, our findings suggest that policies focusing solely on family planning are unlikely to increase female labor force participation.

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